Variations in the Convolutional Pattern of Brains of the Insane.

by

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VARIATIONS IN THE CONVOLUTIONAL PATTERN IN BRAINS OF THE INSANE.

The object of the following thesis is to work out the regions of greatest variation of the fissures in brains of the insane, - to find, if possible any regular irregularity in the different regions, and to draw conclusions from the result.

For the purpose, seventeen brains have been collected, being specially selected as types of lunatic brains. These were carefully stripped and examined in detail.

In addition, the writer had access to a museum, containing over a hundred preserved specimens, from which observations were taken. It was impossible to make a careful study of the whole brain, therefore attention has been confined to the outer surface of the hemispheres, where the most important variations occur (with the exception of the calcarine area).

As there is no standard of a "normal" brain available, the text-book description has been adopted. The nomenclature is taken from Cunningham and Van Gchuchten, whose authority seems the most reliable.

The variations in each fissure are first described in detail, - this is followed by a commentary on the results of the work and concluded with

a short summary. At the end there is appended the detailed description of each brain as it was examined, along with photographs of the brains.

FISSURE OF SYLVIUS.

This fissure is one of the most constant of the primary fissures, yet the variations in individual brains, and in opposite sides of the same brain are numerous.

Normally, the orbital operculum of the Island of Reil is subdivided by a fissure - the anterior horizontal branch of the Fissure of Sylvius.

The absence of this fissure is a common feature - especially on the right hemisphere. It is very often represented by a mere notch, and it is invariably shorter than the ascending branch.

This is explicable comparatively, as it is only in man that we have a development of this fissure, and it only appears late in foetal life. The fissure is fairly constant on the left side.

The mode of origin varies in different brains. The commonest origin is from the same stem as the ascending branch, but in many brains it arises ¼ inch further forwards. The direction is horizontal, but sometimes it has an upward inclination.

The anterior ascending branch is constantly present, and varies only in its length, which may be anything short of 1 inch.

Sometimes it is separated by only a narrow gyrus from the inferior frontal sulcus.

The posterior horizontal branch shows many

types of variation, especially at its posterior end. The direction is usually horizontal, sometimes with an upward inclination.

Behind the Fissure of Rolando, it is more complicated. Commonly, it turns up obliquely into the parietal lobe, but in many cases it turns up vertically, and rarely with a slight forward inclination. The length of the fissure is most inconstant. Normally, it runs up behind the inferior postcentral sulcus for about 1 inch, where it is terminated by the supra-marginal gyrus, but in the abnormal type of brain under observation, we find all gradations in length from a very abrupt termination just above the horizontal part to a long continuation up to and even through the horizontal branch of the intraparietal sulcus. The termination is as a rule bifurcated, one branch - the continuation of the main stem passing upwards into the parietal lobe, and the other passing backwards. The latter may open into the first temporal sulcus, or it may be separated from it by a narrow annectant gyrus.

A small superficial annectant gyrus may separate this branch from the main stem at its commencement.

Sometimes this branch has an inclination downwards into the first temporal lobe. A rare variation is a second branch, arising from the ascending

terminal piece and running backwards.

Sometimes, the course of the ascending terminal piece is broken by a superficial gyrus.

FISSURE OF ROLANDO.

The variations in this important fissure are not very marked. Being laid down comparatively early (5th month), it is not so much liable to be altered by growth and development.

Its position about midway between the frontal and occipital poles is fairly constant. In lunatic brains, we find it more often further back than it is described in normal brains.

Its direction and course show more variation. Instead of two parts inclined obliquely forwards with a horizontal part between them, we more often find an almost vertical fissure, without any marked angles or genu.

The most common course for the sulcus is to show two pairs of genu. The first of each pair has its concavity forwards, - the second, the convexity forwards.

The parts of the sulcus between each of the two pairs of genu are directed obliquely forwards, while the part joining the two pairs is nearly vertical. As a rule, the lowest genu is the most marked. In a few cases, the upper genu has its convexity forwards.

There are anomalies to be found in the length of the fissure. Instead of turning over the supra-mesial border of the hemisphere, it begins a short

distance from it - being separated from the Great Longitudinal Fissure by a narrow gyrus. The upper end may also run backwards for ½ - 1 inch parallel to the Great Longitudinal Fissure on the superior surface of the hemisphere.

The lower end in a small proportion of cases cuts into the Fissure of Sylvius, and sometimes it bifurcates into two short branches.

Invariably, there is a deep annectant gyrus at the bottom of the fissure. The situation varies, but in the majority of cases, it is found at the superior genu; in only a few, lower down.

The reduplication of the Fissure of Rolando - as first noted by Giacomini in 1882 - has been found only in one brain.

The pre-rolandic and post-rolandic sulci are well marked, and quite separate. It occurred in both hemispheres.

EXTERNAL PARIETO-OCCIPITAL FISSURE.

The External Parieto-Occipital Fissure is rarely found in lunatic brains as described in the normal brain. A short single transverse sulcus is unusual.

In the majority of the brains under examination, the fissure is bifurcated, and there are many variations in this bifurcation.

The fissure may cut the supra-mesial border as a single sulcus, and then diverge into two - either Y shaped or T shaped. The main stem may be very short - $\frac{1}{8}$ inch and the branches $\frac{1}{2}$ inch, or the main stem may be $\frac{1}{2}$ - $\frac{3}{4}$ inch and the branches only $\frac{1}{8}$ inch. Sometimes, the anterior branch runs into the Ramus Occipitalis.

In some cases the fissure bifurcates on the internal surface of the hemisphere, and comes over the supra-mesial edge as a double fissure, or it divides into two just at the supra-mesial border.

There is no regularity in its direction, sometimes it is directed forwards - sometimes outwards - sometimes backwards.

INFERIOR PRECENTRAL SULCUS.

This sulcus, being developed early, is well

marked, and the variations are not striking. In many cases, it is continuous with the superior precentral sulcus, which joins it at the union of the vertical and horizontal branches. It is usually situated somewhat in advance of the superior precentral sulcus. The upper end is as a rule branched, and there is great variety in the direction of the branches. We sometimes have a branching at right angles to the vertical part, making a T shaped fissure, but more often the direction of the branches produces a Y shaped appearance. Each of these branches may again be branched. The length of the branches varies from $\frac{1}{4}$ - 1 inch.

The main stem itself sometimes gives off a short branch running forward into the middle frontal gyrus.

As a rule, the lower end is separated from the Fissure of Sylvius by a narrow annectant gyrus, but sometimes it opens directly into it behind the diagonal sulcus.

SUPERIOR PRECENTIAL SULCUS.

This fissure is supposed to be a detached portion of the superior frontal sulcus. In most cases, it is not detached, but the superior frontal sulcus opens directly out of it at right angles. If it

is detached, the separation is only by a narrow annectant gyrus. It is not always a simple vertical sulcus. There is often a horizontal part at the superior end, running either backwards or forwards, or the upper end is bifurcated. Occasionally it runs backwards and downwards, and opens into the Fissure of Rolando at the superior genu, or it may be directly continuous with the inferior precentral sulcus.

The superior frontal sulcus may cut right through it into the ascending frontal gyrus. In many brains we find branches - commonly two short ones - one anterior and the other posterior - given off just above the junction with the superior frontal sulcus.

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SUPERIOR FRONTAL SULCUS.

This sulcus as a rule opens out of the superior precentral sulcus, at right angles, and runs forwards and slightly inwards ending 1½ - 2 inches from the frontal pole.

Sometimes it opens into the Great Longitudinal Fissure. As mentioned above, it is sometimes separated from the superior precentral sulcus by a narrow gyrus.

The course of the fissure is very irregular. In only the simplest marked types of brain is it

a single straight sulcus. More commonly it is sinuous and branched. Almost a constant branch is one running downwards in front of and parallel to the superior precentral sulcus. It is about ½ - 1 inch long, and it may open into the inferior precentral sulcus about the angle. Other branches are short ones, - from one to three in number, running inwards towards the supra-mesial border. The termination is often bifurcated. The course of the sulcus is often interrupted by superficial annectant gyri, connecting the superior and middle frontal gyri. These are situated in the anterior part of the sulcus.

MIDDLE FRONTAL SULCUS.

It is extremely difficult to find a "type" of this sulcus. The only part which is fairly constant is the extreme anterior end, where it bifurcates along the orbital margin, into the Sulcus fronto-marginalis of Wernicke. It is only the length of this part which varies and that ranges from ½ inch to 1½ inches.

Another feature which one finds common to this fissure in most brains is the spiked arrangement of the branches. As a rule it starts high up, near the termination of the sulcus frontalis superior, and runs downwards and forwards. However

in many simply marked types of brain, it can be traced back almost to the inferior precentral sulcus, and in these cases it completely subdivides the middle frontal gyrus. Branches are given off upwards and downwards, and often the posterior end is bifurcated as well as the anterior.

Annectant gyri, two in number, one near the anterior end and one about the middle, interrupt the course of the sulcus in a few cases.

INFERIOR FRONTAL SULCUS.

While the varietions in this sulcus are not marked in different brains, there are regularly striking differences in the two hemispheres of the same brain.

The fissure as a rule opens out of the inferior precentral sulcus about the angle, but in a large number of cases, it is separated from it by a superficial annectant gyrus.

It proceeds downwards and forwards, very often with a curved course,with the concavity downwards, towards the supraciliary margin, where it sometimes bifurcates. The terminal bifurcation varies in its approximation to the supraciliary margin. One or more annectant gyri may cross it near its termination, and thus we have two or three parallel transverse sulci.

About the middle of the fissure, there is often an annectant gyrus - sometimes superficial, sometimes deep - connecting the middle and inferior frontal gyri. This makes the course of the fissure more sinuous.

The branches are very irregular. Often the diagonal sulcus opens into it near the beginning. The other branches are short, but there is one longer one, commonly present, which opens into the middle frontal sulcus.

SULCUS DIAGONALIS,

is constantly present. The only variation it shows is in being occasionally separated from the inferior frontal sulcus by a narrow gyrus.

SULCUS PARAMEDIALIS.

A strange anomaly is that in some most simply marked brains, this sulcus is very definite, and is represented by a deep fissure or fissures 1 - 2 inches long. In only a few brains is it poorly marked or absent altogether.

INTRAPARIETAL SULCUS OF TURNER.

The component parts of this fissure show many variations in regard to each other, as well as individual anomalies.

The standard type is one where we find all

four parts apparently continuous. On more minute examination, and without exception in the brains under observation, the superior and inferior post-central sulci are separated by an annectant gyrus - in most cases deep - but in a fair proportion superficial. As a rule, the inferior post-central and the horizontal ramus are continuous, sometimes forming one straight line, but here again we find an annectant gyrus, which is only rarely superficial. The junction of the ramus horizontalis with the ramus occipitalis is more often broken by a superficial gyrus, although it is deep in many cases.

INFERIOR POST-CENTRAL SULCUS,

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runs downwards and forwards, sometimes in a sinuous manner, between the lower part of the Fissure of Rolando, and the upturned end of the Fissure of Sylvius.

The lower end is usually bifurcated.

Sometimes it opens into the Fissure of Sylvius, or is only separated by a narrow gyrus. It usually gives off a branch running towards the Fissure of Rolando about its inferior genu, and very often a short branch is given off running backwards.

SUPERIOR POST-CENTRAL SULCUS,

usually is L shaped. Its direction depends greatly on the Fissure of Rolando, to which the upper part runs parallel as a rule. In the great majority of the brains, the upper end is bifurcated.

The posterior branch of the bifurcation sometimes cuts the supra-mesial border.

In some cases, a branch is given off, running into the Fissure of Rolando, and there is also a short branch running backwards from about the middle.

In two brains, a deep annectant gyrus was found about $\frac{3}{4}$ inch from the junction with the inferior post-central sulcus.

HORIZONTAL BRANCH OF INTRAPARIETAL SULCUS,

is apparently a continuation of the inferior post-central sulcus. It usually has an S shaped course, but sometimes runs directly upwards and backwards to the Ramus Occipitalis.

In its course, we sometimes find one or two deep annectant gyri.

A vertical branch is occasionally given off running down between the upturned end of the Fissure of Sylvius and that of the first temporal sulcus.

RAMUS OCCIPITALIS.

The variations in this sulcus depend entirely on the position and direction of the External Parieto-occipital Fissure.

It is sometimes a simple semicircular fissure, but more often it is rectangular or irregular in shape.

The posterior end always bifurcates, forming the transverse occipital sulcus of Ecker.

In many cases, the anterior end bifurcates, and the lower branch runs down into the parietal lobe behind the first temporal sulcus.

Between the Ramus Occipitalis and the superior post-central sulcus, there is very often a deep transverse sulcus of varying length. Sometimes it is isolated, but more frequently it cuts the supra-mesial border.

FIRST TEMPORAL SULCUS,

varies both in position and in length. Sometimes it is a simple straight fissure, running parallel to the upturned end of the Fissure of Sylvius, but more often it is more complex. It may cut into the horizontal branch of the intraparietal sulcus, or it may be separated from it by the narrow angular gyrus.

Frequently the end is bifurcated, and usually

it gives off short branches.

In a few brains, we find a branch running backwards to the second temporal sulcus.

SECOND TEMPORAL SULCUS.

This is a very variable sulcus in all brains, and the posterior end is the only part which allows of any real description. It runs up in front of the transverse occipital sulcus. It is usually shorter than the first, and a terminal bifurcation is not so common. Sometimes it ascends high in the occipital lobe, and is only separated from the Ramus Occipitalis by a narrow gyrus. Sometimes a posterior branch is apparently continued as the lateral occipital sulcus, but it is always separated by a deep annectant gyrus.

TRANSVERSE OCCIPITAL SULCUS OF ECKER,

has many variations of length and direction. It is usually transverse, but often has a C or L shape - one branch running backwards and downwards to the occipital pole. It may run down near to the lateral occipital sulcus, almost cutting the occipital lobe into two.

Very often we find another sulcus behind and parallel to it.

LATERAL OCCIPITAL SULCUS,

is a well marked fissure, usually running horizontally. It bifurcates at the occipital pole, and the branches vary greatly in length. The superior branch sometimes runs up behind the transverse occipital sulcus. It very often gives off a branch running forwards and downwards. In place of this branch, we sometimes find another sulcus running parallel to it and below it.

A short curved sulcus is occasionally found lying between the lateral occipital and the supra-mesial border, and several shallow sulci are found running indefinitely through the gyri between the main fissures, making the pattern of the occipital lobe very complex.

COMMENTARY.

While it is difficult to derive definite conclusions from the study of the limited number of brains obtainable, yet from an anatomical point of view many interesting points have been discovered. It is not possible to say how far the variations in the convolutional pattern are due to the mental condition of the subjects, but judging from photographs and descriptions of apparently normal brains, it is probable that they may be attributed to this cause to a great extent. From the foregoing descriptions, it will be seen that the widest

variations occur in the parieto-temporal associative area of Flechsig, and especially in the posterior part of that area.

It is rare to find an occipital region, which conforms to the description of the normal, and no two brains are quite alike.

Not so definite, but still marked, are the varied features of the prefrontal area.

In some brains, the prefrontal region shows the greater abnormality, in others the occipital area.

On the whole, the complexity and variety of convolutional pattern is much greater than one would expect in lunatic brains, and the average pattern is no less simple than that of normal brains (excluding congenital idiocy - no type of which has been described)

Certain features, which have been described as being peculiar to highly developed brains, have been found well-marked, e.g., the sulcus paramedialis.

A great deal has been written about the Fissure of Rolando and its annectant gyri. The deep annectant gyrus at the superior genu, which is supposed to be found most constantly present in brains of highest development, was found invariably, although the second and lower deep annectant gyrus was rarely found.

The doubling of the Fissure of Rolando was found

only once, and its significance is very questionable. It is most probably an accidant of development.

The region of Affenspalte is full of anomalies, but from the examination of the lunatic brains no fissure was found which in any degree of probability represented that fissure.

SUMMARY.

1. Wide variations are common in lunatic brains.

2. The greatest variation occurs in the parieto-temporal and prefrontal associative areas of Flechsig.

3. There is no evidence that the brains of lunatics revert to a lower type.

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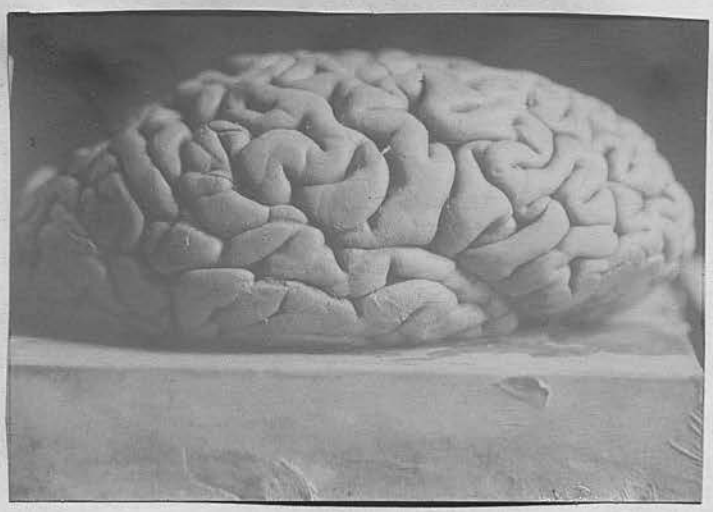


DESCRIPTION OF BRAINS.

I. Right Hemisphere.

Fissuration seems very simple.

Fissure of Sylvius.

All branches are separate and simple.

Fissure of Rolando,

does not cut superior border.

External Parieto-occipital Fissure is bounded by a very narrow gyrus.

Superior prefrontal sulcus is a short fissure cutting the supra-mesial border.

Inferior prefrontal sulcus is a deep fissure in front of the lower part of the Fissure of Rolando. It bifurcates at its upper end.

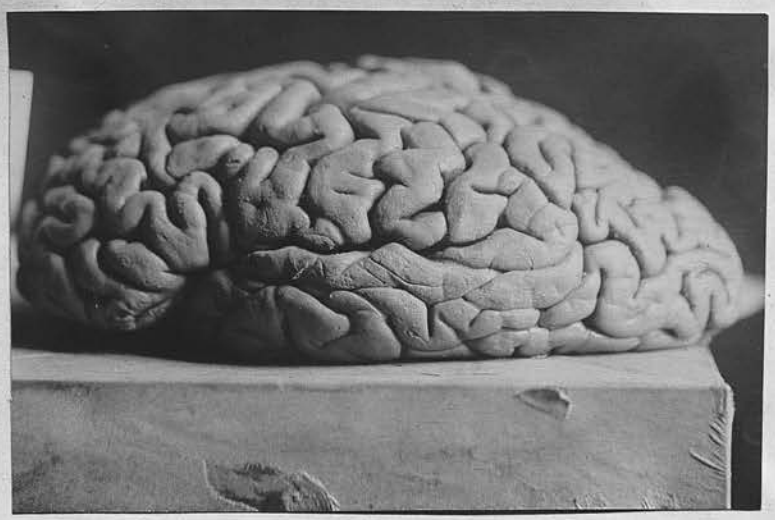
Superior frontal sulcus is a long fissure running from the Fissure of Rolando to near the frontal pole.

Middle Frontal Sulcus starts in the angle between the transverse and horizontal branches of the inferior precentral sulcus, and runs forwards to the orbital border, bifurcating there.

Inferior frontal sulcus is short and bifurcates at either end, the lower branch running into the Fissure of Sylvius.

Sulcus postcentralis superior is short and cuts the supra-mesial border.

Sulcus postcentralis inferior bifurcates at its



upper end, and runs nearly the whole length of the Fissure of Rolando.

The Ramus horizontalis, which commences from the middle of this, runs back to the Ramus occipitalis, at the same time sending a branch up and down almost dividing the parietal lobe into two.

Ramus occipitalis transversus divides the occipital lobe.

First temporal sulcus is a long fissure running almost up to the external parieto-occipital fissure.

Second temporal sulcus is shorter and bifurcates, one branch running back into the occipital lobe - the other forwards.

Left Hemisphere.

Fissure of Sylvius. The posterior horizontal limb is interrupted near its termination by a superficial gyrus.

Anterior horizontal branch is a short fissure running forwards into the frontal lobe while the ascending limb is deep and runs directly upwards.

Fissure of Rolando does not cut supre-mesial border. Inferior genu is well marked, and there is deep annectant gyrus at superior genu.

Exterior Parieto-occipital is short and bifurcates.

Superior precentral sulcus is short and cuts the supra-mesial border.

Inferior precentral sulcus lies behind and below this. From the middle of it, the middle frontal sulcus runs forwards, irregular and sinuous, and bifurcating, one branch running downwards to the left supra-orbital margin, the other running to the anterior pole, and again bifurcating.

The superior frontal sulcus is simple.

The inferior frontal sulcus is complex, being interrupted by a large superficial annectant gyrus. It bifurcates both in front and behind, and the sulcus diagonalis cuts into it.

The superior post-central sulcus bifurcates at its upper end.

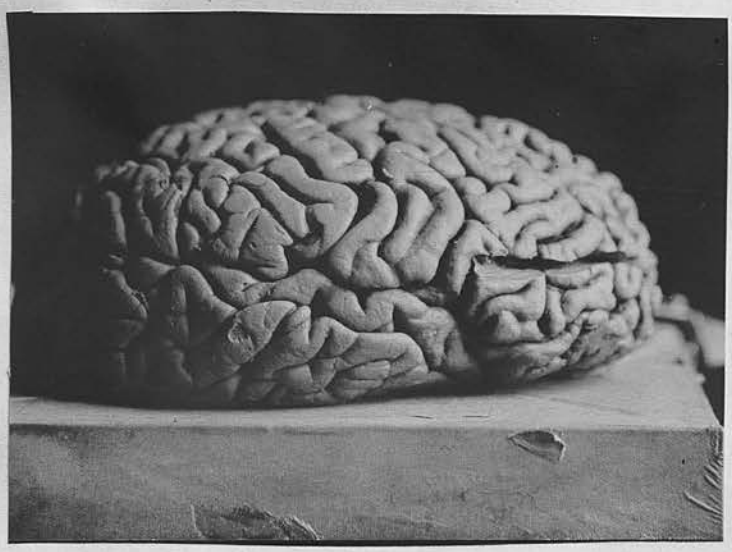
The inferior post-central is separated from it by a superficial annectant gyrus.

The horizontal branch runs backwards and upwards to the ramus occipitalis, which bifurcates behind to form the ramus transversus.

The upturned end of the calloso-marginal fissure forms a deep sulcus which bifurcates on the external surface.

The first temporal sulcus runs upwards into the parietal lobe - its termination being separated from the ramus horizontalis by a very narrow gyrus.

The second temporal sulcus runs along the infero-lateral border and bifurcates - one branch running up into the occipital lobe, the other running back to the occipital pole.



2. Right Hemisphere.

Fissure of Sylvius becomes superficial on account of a deep annectant gyrus 1½ inches behind the Fissure of Rolando, then dips down and ascends into the parietal lobe.

The anterior branches are short.

Fissure of Rolando is double. Posterior division does not ascend so high as the anterior division, but it cuts into the Fissure of Sylvius.

The anterior division cuts supra-mesial border, but not the Fissure of Sylvius.

External parieto-occipital fissure bifurcates.

The frontal lobe is very irregular.

The superior frontal sulcus is well marked and regular.

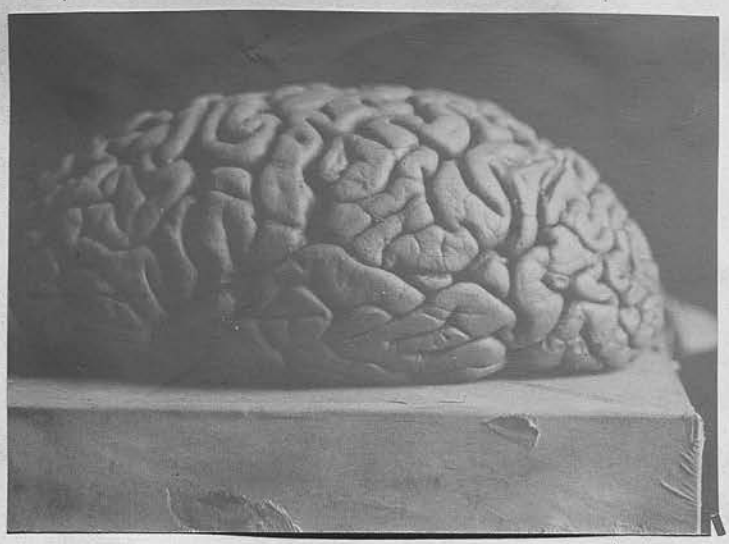
The sulcus precentralis superior lies in front of the upper part of the Fissure of Rolando.

The inferior post-central and the horizontal branches of the intreparietal sulcus lie almost in one straight line. The superior post central sulcus is S shaped, and is separated from the inferior post-central.

The sulcus occipitalis transversus bifurcates at the lower end.

The lateral occipital sulcus runs from the second temporal sulcus to the occipital pole, where it bifurcates.

Between this and the sulcus of Ecker there is a short curved sulcus with its convexity downwards.



Left Hemisphere.

Fissure of Sylvius runs backwards and meets with the first temporal sulcus, and then turns upwards into the parietal lobe.

Fissure of Rolando is double, the sulci being separated by a narrow gyrus. Neither part cuts the supra-mesial border, and the posterior part only runs into the Fissure of Sylvius. The fissures are very sinuous, but parallel in their whole extent.

The external parieto-occipital fissure cuts the supra-mesial border two inches in front of the occipital pole.

Sulcus precentralis superior is short and from it the superior frontal sulcus runs forwards.

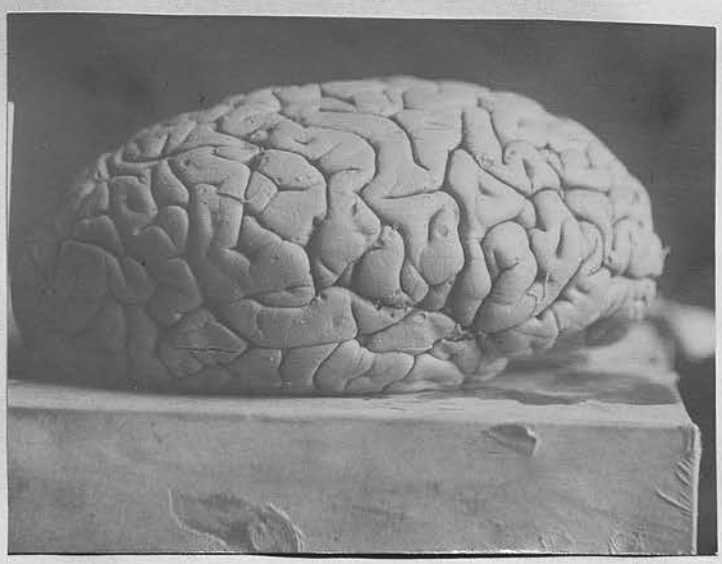
Sulcus precentralis inferior lies in front of the anterior Rolandic sulcus. The inferior frontal sulcus opens out of the middle part.

The middle frontal sulcus is irregular - star-shaped behind, and separated by a narrow gyrus from its anterior part, which runs forwards and bifurcates near the supra-ciliary margin.

Inferior post-central sulcus lies behind the lower part of posterior Rolandic fissure. The horizontal part runs back to the Ramus occipitalis.

The superior post-central is short and broken up.

The transverse occipital sulcus runs into the lateral occipital at its bifurcation.



3. Right Hemisphere.

Fissure of Sylvius. Both anterior branches are long.

The horizontal branch runs forwards for 1½ inches.

The ascending branch is 1 inch long.

The posterior limb turns vertically upwards and almost meets the horizontal branch of the intra-parietal sulcus.

Fissure of Rolando does not cut supra-medial border. It starts in two branches which fuse, then receive a short third branch. It stops just above the Fissure of Sylvius.

External parieto-occipital fissure bifurcates before it reaches the external surface.

Superior precentral sulcus has a forward inclination.

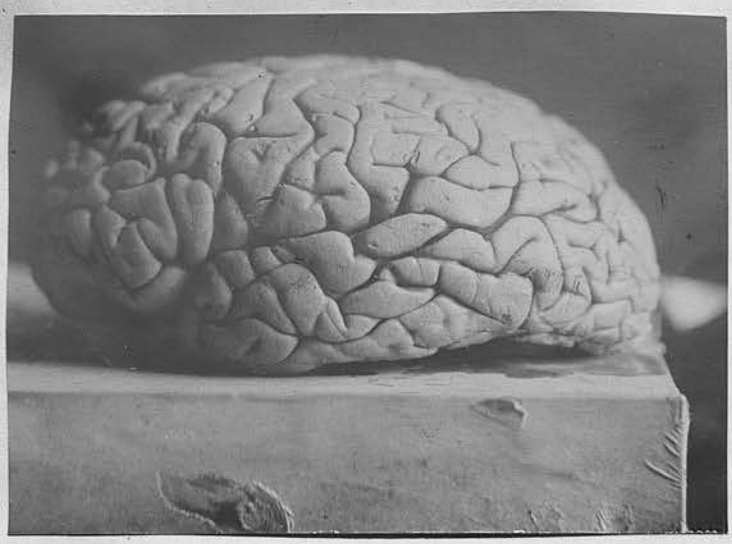
From the centre the superior frontal sulcus runs forwards.

Inferior precentral sulcus is rectangular in shape. From the upper horizontal part the middle frontal sulcus runs forwards and upwards - then downwards to the frontal pole - bifurcating there.

Inferior frontal sulcus is a short curved fissure running between the horizontal and ascending branches of the Fissure of Sylvius.

Intra-parietal sulcus.

Superior and inferior post central sulci form a continuous fissure lying behind and parallel to the Fissure of Rolando. From the middle a second



branch runs downwards for 1¼ inches.

The horizontal branch is separated by annectant gyri from the vertical stem, and from the ramus occipitalis. A short branch runs downwards behind the ascending terminal piece of the Fissure of Sylvius. The ramus occipitalis bifurcates at either end.

The first temporal sulcus runs upwards, only separated by a small annectant gyrus from the ramus occipitalis.

The second temporal sulcus becomes continuous with the outer end of the transverse occipital sulcus.

Left Hemisphere.

Fissure of Sylvius. The ascending branch is short - the horizontal runs forwards along the supra-orbital margin.

The posterior horizontal runs back and up to the horizontal branch of the intraparietal sulcus.

Fissure of Rolando does not cut the supra-mesial border. It bifurcates at the upper end. The superior genu is well marked.

External parieto-occipital fissure bifurcates and the branches run antero-posteriorally along the supra-mesial border.

The precentral sulci are continuous. The lower part is cut across by a deep sulcus - the inferior frontal sulcus. This is again interrupted by a superficial gyrus.

The middle frontal sulcus bifurcates at either end.

The superior frontal sulcus is represented by a number of small transverse sulci.

Intraparietal Sulcus.

Sulcus postcentralis superior is a short shallow sulcus lying behind the upper part of the Fissure of Rolando.

Sulcus postcentralis inferior. The vertical part runs from Fissure of Sylvius to the superior genu of the Fissure of Rolando.

The horizontal part runs upwards and backwards to the Ramus occipitalis.

A deep fissure starts from the point of bifurcation of the Parieto-occipital fissure, but is separated from it by a small gyrus.

Ramus occipitalia transversus opens into the lateral occipital sulcus, which divides the occipital lobe. It does not bifurcate.

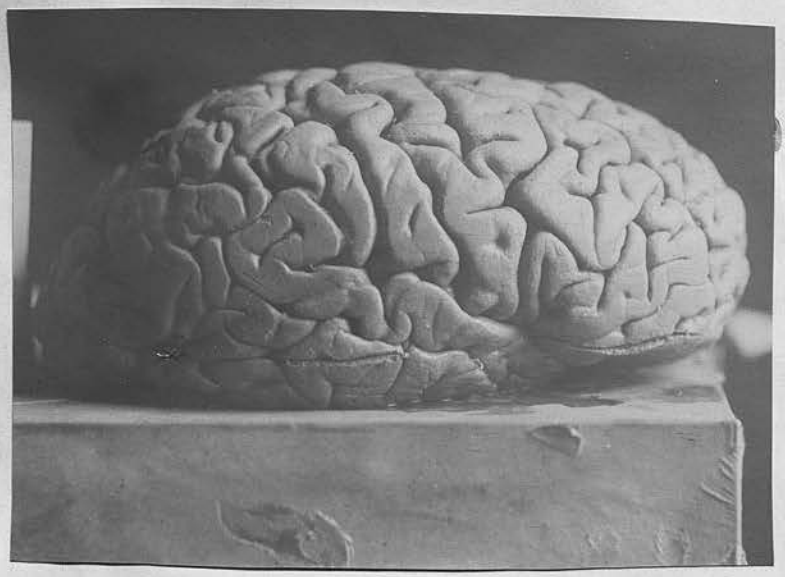
Below and parallel to this is a second shorter sulcus

4. Right Hemisphere.

Fissure of Sylvius.

Anterior ascending and horizontal branches have a common stem. The anterior horizontal branch is very short.

Posterior horizontal branch is very short and is limited by a gyrus in which there is a short sulcus.



Fissure of Rolando is uninterrupted. Both genu are well marked. There are double annectant gyri at the superior genu.

Parieto-occipital fissure has a short stem which bifurcates on the external surface.

Superior precentral sulcus is parallel with the upper half of the Fissure of Rolando. It is triradiate at either end.

Inferior precentral sulcus consists of a short vertical stem with a small branch running backwards. The horizontal part runs upwards and forwards and ends in a bifurcation.

Superior frontal sulcus is separated by a narrow convolution from the superior precentral. It runs horizontally forwards, and is cut into by a branch of the inferior precentral.

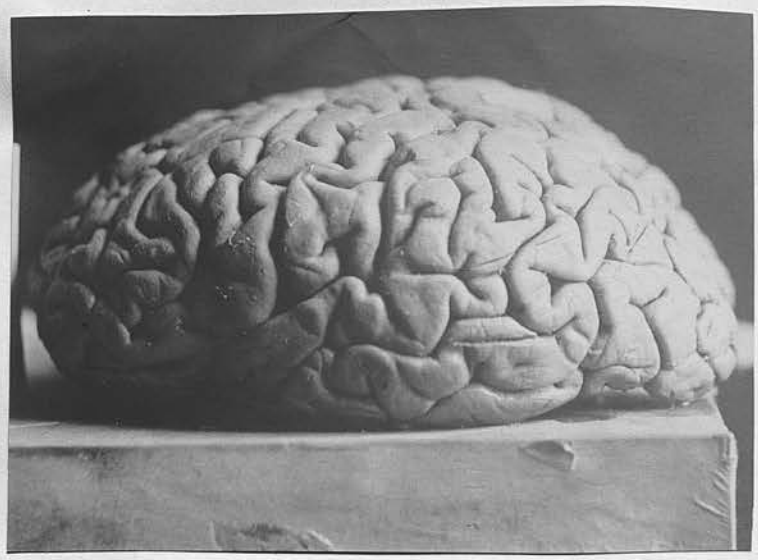
Middle frontal sulcus runs downwards and forwards to the supra-ciliary border and ends in a bifurcation - the sulcus fronto marginalis.

Inferior frontal sulcus start from the inferior precentral, and ends 1 inch above the supraciliary margin in a bifurcation.

Sulcus diagonalis cuts into the Fissure of Sylvius.

Sulcus postcentralis superior runs downwards and forwards into superior genu of Fissure of Rolando.

Inferior postcentral runs upwards, then backwards as horizontal branch.



There is a short fissure behind and parallel to the superior postcentral.

Ramus occipitalis is continuous with the ramus horizontalis.

Sulcus transversus well marked.

In front of the ramus occipitalis is a short transverse fissure separated from it by annectant gyrus.

Ramus occipitalis lateris is L shaped - bifurcating at the occipital end.

Left Hemisphere.

Fissure of Sylvius. Anterior horizontal limb runs forwards into frontal lobe for ¾ inch. Ascending limb is a deep fissure opening into the sulcus diagonalis.

Posterior horizontal limb ends in a bifurcation at right angles to the main stem.

Parieto-occipital is trifid on the external surface with two short branches, and the median one is continuous with the horizontal branch of inferior post central.

Superior precentral sulcus is 2 inches long. It has a branch running back to the Fissure of Rolando, and one forwards, parallel to the supramesial border, and bifurcating.

Inferior precentral sulcus.

The vertical stem lies in front of the superior precentral for part of its course. The horizontal

branch runs forwards and bifurcates at right angles - the upper branch proceeding to the mesial border and again bifurcating, separated by a deep annectant gyrus from the sulcus paramedialis.

Middle frontal sulcus is complex. It starts in a vertical fissure parallel to the lower part of the horizontal branch of the inferior precentral sulcus. It then runs downwards and forwards to the supra-orbital margin.

Inferior frontal sulcus is a short sulcus which starts near the sulcus diagonalis.

It runs forwards and its termination is separated from the middle frontal by a short gyrus.

Sulcus diagonalis runs from horizontal branch of the inferior precentral down to the Fissure of Sylvius.

Ramus postcentralis superior and inferior are continuous.

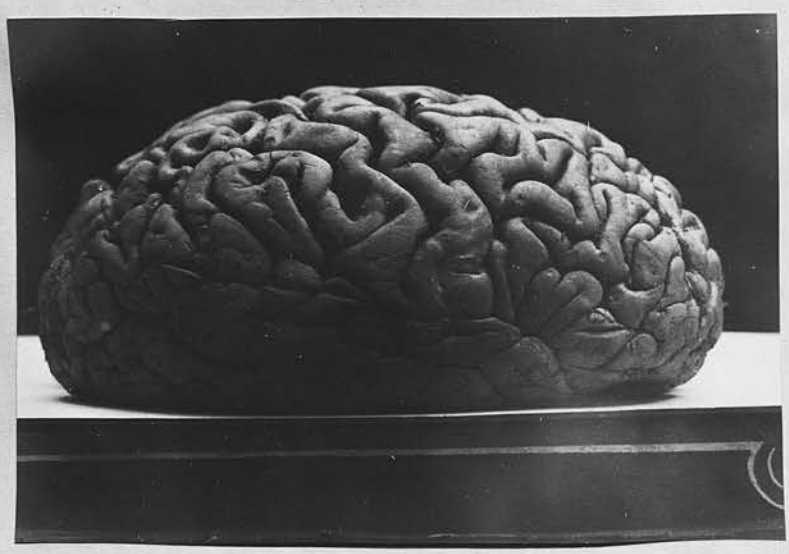
Ramus horizontalis runs up to the ramus occipitalis.

Ramus occipitalis transversus bifurcates near the supra-mesial border.

Ramus occipitalis laterlis opens out from the second temporal sulcus, and bifurcates near the occipital pole.

5. Fissure of Sylvius.

Anterior horizontal branch is very short and separate from anterior ascending, which is $\frac{3}{4}$ inch



long. The posterior horizontal ramus ascends behind the inferior post frontal and bifurcates - one branch running forwards to the Fissure of Rolando.

Fissure of Rolando does not cut either supra-mesial border or Fissure of Sylvius. It is nearly vertical. The superior genu is rectangular but short and the inferior genu is not well marked.

External parieto-occipital fissure bifurcates at its termination and sends a short branch backwards parallel to the supra-mesial border.

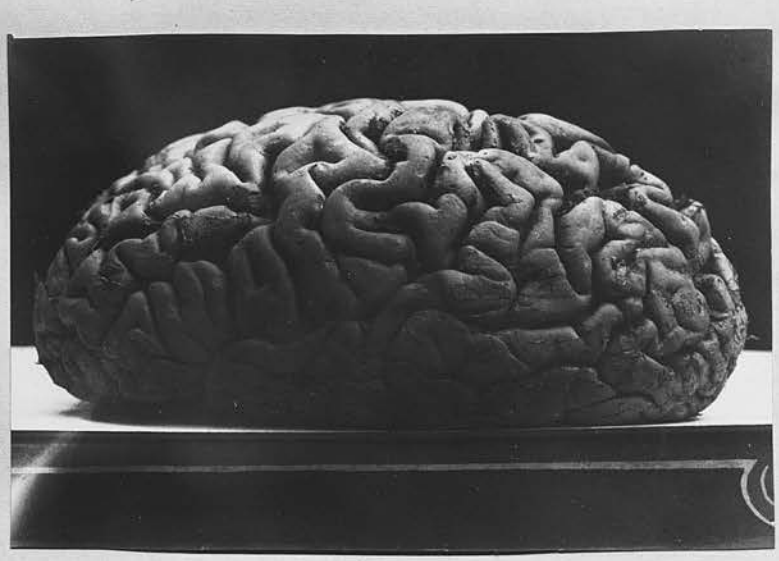
Superior precentral sulcus runs from supra-mesial border parallel to the Fissure of Rolando for 3 inches. It is interrupted by a deep annectant gyrus and by the superior frontal sulcus.

Inferior prefrontal sulcus lies in advance of and below the superior. It cuts the Fissure of Sylvius, and bifurcates at its upper end.

Superior frontal has an almost uninterrupted course from the Fissure of Rolando to the frontal pole. About the middle of its course, there is a small superficial annectant gyrus, running vertically.

Middle frontal sulcus takes a sinuous course from the inferior precentral - first forwards then upwards - then downwards and forwards to the frontal pole where it bifurcates.

Between the superior frontal and the posterior part of the middle frontal, there is a deep trifid fissure, and one downwards and forwards.



Inferior frontal sulcus runs downwards and forwards from the inferior precentral fissure.

Sulcus diagonalis runs into the Fissure of Sylvius in front of the inferior precentral sulcus.

Intraparietal sulcus.

Superior and inferior postcentral are continuous.

The horizontal branch runs backwards and upwards from the inferior, but is separated from the ramus occipitalis by a narrow annectant gyrus.

Behind, the superior postcentral and parallel to it, lies a short deep curved sulcus.

Ramus occipitalis bifurcates in front and behind.

The posterior branch forms the sulcus occipitalis transversus.

The lateral occipital sulcus lies below and parallel. It bifurcates at the occipital pole.

Left Hemisphere.

Fissure of Sylvius. Anterior branches arise from a common stem.

Posterior horizontal bifurcates behind the Fissure of Rolando. One branch runs forwards to the Fissure of Rolando, and one upwards behind the inferior post-central sulcus.

Fissure of Rolando cuts the supra-mesial border.

The inferior genu is the more marked.

It is nearly vertical.

External parieto occipital fissure is situated

far back. It gives off a branch running backwards.

Superior precentral sulcus. The inferior end curves backwards towards the Fissure of Rolando at the inferior genu.

Inferior precentral sulcus starts just below superior frontal sulcus, and runs down to the Fissure of Sylvius. Between it and the Fissure of Rolando there is a short transverse sulcus.

Superior frontal sulcus runs forwards from the superior precentral to within 1 inch of the frontal pole.

Middle frontal and inferior frontal have a common origin at the inferior precentral sulcus, and take a direct course forwards.

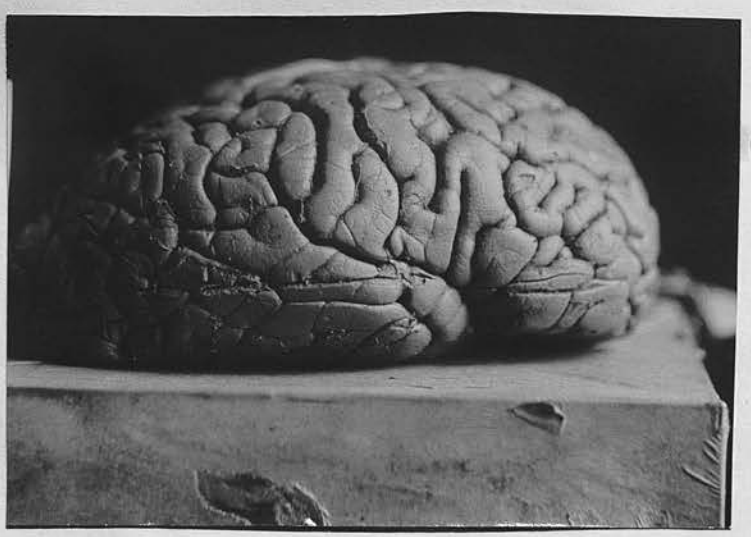
The middle frontal bifurcates at its termination.

The frontal lobules are fissured by regular transverse sulci.

Superior and inferior post-central sulci are continuous. The former is very deep.

Between the superior and the ramus occipitalis there is a deep triradiate sulcus - the posterior branch of which runs into the superior post-central sulcus.

Ramus occipitalis bifurcates at either end. The anterior branch is 4 inches long. The posterior forms the transverse occipital sulcus. The lateral occipital sulcus lies below and parallel to it.



6. Right Hemisphere.

Fissure of Sylvius. Both anterior branches run into the inferior frontal sulcus.

The posterior horizontal sulcus takes an upward then downward bend, and its course in the parietal lobe is interrupted by a superficial annectant gyrus.

Fissure of Rolando is almost vertical in direction and it runs unbroken from the supra-mesial border to the Fissure of Sylvius.

External parieto-occipital fissure takes a Z shaped course.

Superior precentral sulcus is continuous with the inferior.

Sulcus paramedialis is a fissure running parallel to the supra mesial border for 2 inches.

Superior frontal sulcus cuts the superior precentral about its middle and runs back to the Fissure of Rolando, and forwards for 1½ inches. It then bifurcates and is represented in its anterior half by two transverse sulci.

Middle frontal sulcus runs from the middle of the inferior precentral sulcus. It runs forwards and bifurcates - one branch running toward the supra-mesial sulcus - the other down to the supra-ciliary margin.

Inferior frontal sulcus is a short sulcus in the antero-external part of the frontal lobe. Running into it there are three short vertical fissures.

Sulcus diagonalis lies in front of the inferior precentral, and cuts into the Fissure of Sylvius.

Superior and inferior postcentral sulci are continuous. The horizontal branch is separated by a small annectant gyrus, and runs into the ramus occipitalis.

This bifurcates in front and behind.

From the middle of the superior post central sulcus a short fissure runs back and bifurcates - one branch opening into the ramus horizontalis. The transverse occipital sulcus is curved.

Left Hemisphere.

Fissure of Sylvius.

The anterior branch cuts into the inferior frontal sulcus. The posterior horizontal turns abruptly up into the parietal lobe, and crosses the horizontal branch of the intra-parietal sulcus.

Fissure of Rolando is interrupted at the superior genu by a superficial annectant gyrus. The lower end does not cut into the Fissure of Sylvius.

External parieto-occipital fissure is situated far back, and is double.

Superior precentral sulcus runs back into the Fissure of Rolando. From it, the superior frontal sulcus runs forwards.

The inferior precentral sulcus lies in front of and below this, and cuts into the Fissure of Sylvius.

From it the middle frontal sulcus takes a sinuous course upwards and forwards. Below this the inferior frontal sulcus runs forwards, bifurcating, and the lower branch runs towards the anterior pole. A vertical sulcus cuts the middle of this fissure.

Superior post central sulcus lies behind the upper part of the Fissure of Rolando.

Inferior post central runs upwards from the Fissure of Sylvius, and the horizontal branch is continuous with the upper end and runs into the Ramus occipitalis.

Ramus occipitalis bifurcates in front and behind.

Between the anterior bifurcation and the Fissure of Rolando there are two transverse fissures - one long and another short. Round the lower end of the transverse occipital sulcus, a short fissure circles, and below this a longer one - the lateral occipital sulcus - parallel to the occipito-temporal border.

7. Right Hemisphere,

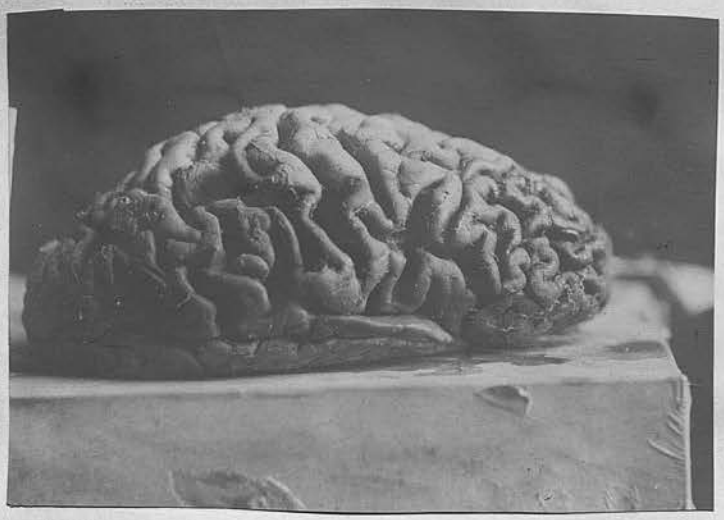
Fissure of Sylvius.

Anterior ascending and horizontal branches are separated by ½ inch at their origin.

Posterior horizontal is short, and bifurcates.

The ascending terminal piece is vertical.

Fissure of Rolando is nearly vertical, and the genu are poorly marked.



The upper has a deep annectant gyrus.

External parieto-occipital fissure bifurcates into two short branches.

Superior precentral sulcus starts ¾ inch from the superior longitudinal sulcus, and runs down parallel to Fissure of Rolando for 1½ inches.

From the upper part, the superior frontal sulcus runs forwards - interrupted near its termination by a superficial annectant gyrus.

Inferior precentral sulcus lies below this. It gives off two branches - one running up vertically for ¾ inch, and the inferior frontal running forwards and downwards to the Fissure of Sylvius.

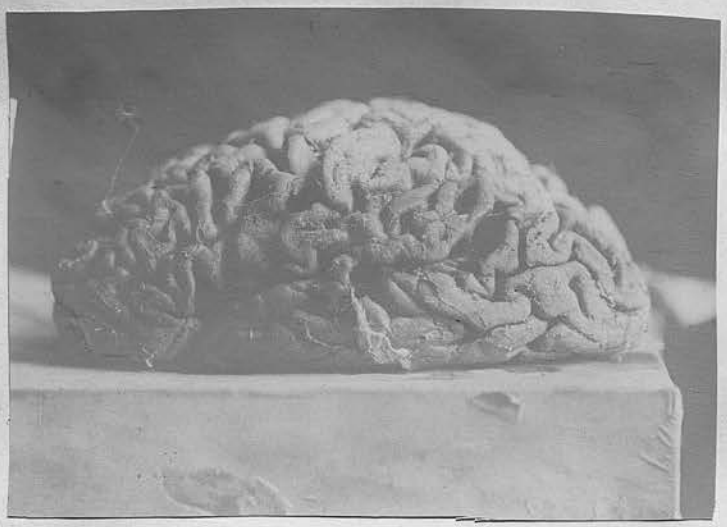
Middle Frontal Sulcus starts from the middle of the lobe, and takes an erratic course forwards to the frontal pole.

Between this and the inferior frontal sulcus there is a deep sulcus interrupted by a deep annectant gyrus running parallel to and between the superior and inferior frontal sulci.

Inferior frontal sulcus is curved with convexity upwards; running from the inferior precentral sulcus and ending in a bifurcation.

Superior and inferior post central sulci are continuous. The horizontal branch runs upwards and backwards from the junction to the Ramus occipitalis. It is interrupted by a superficial gyrus.

Ramus occipitalis bifurcates in front and



behind - the posterior bifurcation forming the sulcus occipitalis transversus.

In front of the anterior branch and behind the Fissure of Rolando there are two deep transverse sulci. The more anterior gives off a branch running towards the Fissure of Rolando. The course of the first temporal sulcus is broken by a superficial gyrus. The second bifurcates - the lower branch running horizontally.

Between this and the sulcus occipitalis transversus there is a triradiate sulcus - each branch of which is only ½ inch long.

Left Hemisphere.

Fissure of Sylvius. The anterior branches arise from a common stem. The posterior horizontal runs into the parietal lobe behind and parallel to the horizontal branch of the intraparietal sulcus.

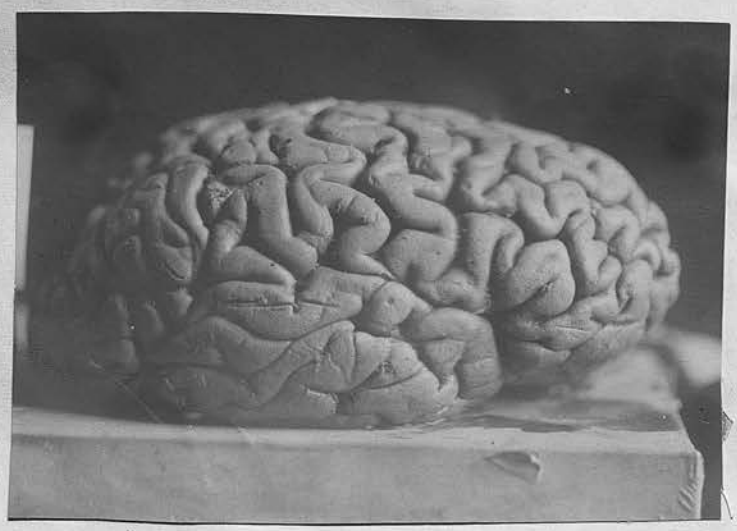
Fissure of Rolando is nearly vertical, and the genu are poorly marked.

External parieto occipital fissure is single and short.

Superior precentral sulcus lies in front of the upper part of the Fissure of Rolando. It sends a short branch back to the Fissure of Rolando, and also two branches forwards.

Superior frontal sulcus is separated from the upper branch by a small superficial annectant gyrus. Its course is broken by three deep annectant gyri.

Inferior precentral lies behind and below the



superior precentral, and from the middle the lower frontal sulcus runs forwards horizontally. The middle frontal sulcus is represented by a series of small transverse fissures.

Intra-parietal sulcus.

Superior post central cuts the supra-mesial border. A branch runs forwards to the Fissure of Rolando, and one back to the horizontal branch. It is separated from the inferior postcentral by a superficial gyrus. The horizontal branch, which is continuous with the inferior post central, is interrupted by a deep annectant gyrus.

Ramus occipitalis bifurcates in front and the external bramch runs forwards to the supefior post-central sulcus.

Sulcus occipitalis transversus is separated from it by a long superficial gyrus.

The second temporal sulcus bifurcates - the posterior branch forming the lateral occipital sulcus.

8. Right Hemisphere.

Fissure of Sylvius. Anterior branches are short. The posterior limb ends 1½" behind the Fissure of Rolando.

Fissure of Rolando does not cut the supra-mesial margin. The direction is vertical, and the superior genu is rectangular.

External parieto-occipital fissure bifurcates at

the supra-mesial border.

Sulcus precentralis superior bifurcates at either end. The lower anterior branch is long and runs parallel to the Fissure of Rolando.

Inferior precentral sulcus lies below and in front of this branch. From the centre the inferior frontal sulcus runs forwards to the supra-orbital margin.

The superior frontal sulcus runs forward from the upper end of the inferior precentral - from which it is separated by a superficial annectant gyrus.

The middle frontal sulcus is T shaped - the vertical part lying anterior and parallel to the inferior precentral.

It bifurcates on the orbital surface.

Intraparietal Sulcus.

Superior post central sulcus bifurcates at the upper end.

Behind this there is a deep sulcus which is possibly a detached portion of the Fissure of Sylvius.

The inferior post central sulcus is T shaped.

The horizontal branch runs into the ramus occipitalis but the continuity is broken by a superficial gyrus.

Ramus occipitalis bifurcates at both ends.

The anterior bifurcation forms a sulcus between the first and second temporal sulci.

First temporal sulcus is connected to the second

by two horizontal sulci.

From the second temporal sulcus a fissure runs back to the occipital pole - the lateral occipital sulcus.

Left Hemisphere.

Fissure of Sylvius. All branches arise from a common stem. The anterior ascending bifurcates - both branches being short. The posterior horizontal limb turns up abruptly at right angles into the parietal lobe.

External parieto-occipital fissure bifurcates.

Fissure of Rolando. Both genu are rectangular.

Superior precentral sulcus is short.

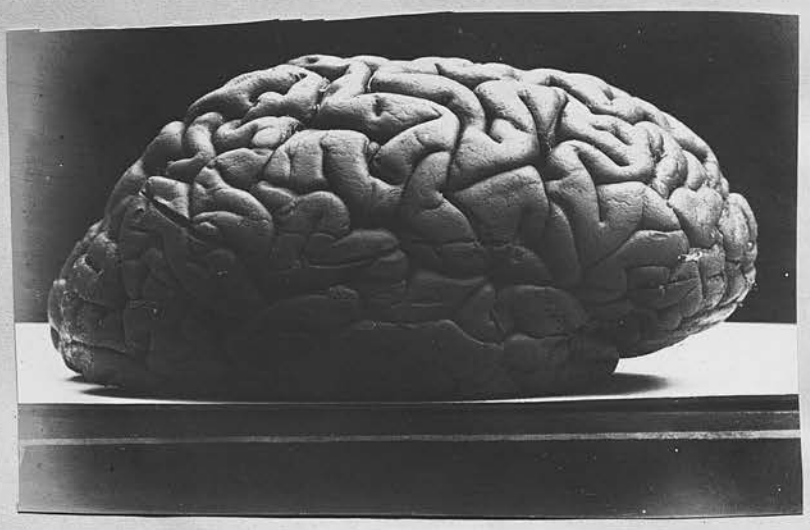
From the middle the superior frontal sulcus runs forwards nearly to the supra-orbital margin. It gives off several branches.

Inferior precentral sulcus lies below and in front of the superior precentral.

It opens into the Fissure of Sylvius.

From the centre - a branch leads back to the Fissure of Rolando and another forwards - the inferior frontal sulcus. This is short, and ends in a bifurcation - the upper end of which cuts into the Middle Frontal Sulcus.

Middle frontal sulcus begins in a vertical fissure in front of the inferior precentral, and takes a very sinuous course forwards interrupted by a superficial annectant gyrus. It ends in a transverse fissure along the supra-orbital margin.



Below and in front of the inferior frontal there is an X shaped fissure.

Superior and inferior post central sulci are continuous.

The transverse branch runs into one of the branches of the Ramus Occipitalis.

Ramus Occipitalis is a long fissure running parallel to the supra-mesial border. It bifurcates anteriorally - one branch running forwards to the superior post central sulcus - the other downwards.

The posterior end bifurcates forming the sulcus occipitalis transversus.

The temporal sulci ascend high in the occipital lobe.

9. Right Hemisphere.

Fissure of Sylvius. Ascending and horizontal branches arise from a common stem. The former runs up to the inferior prefrontal sulcus.

Posterior horizontal limb bifurcates and the posterior branch runs into the ascending stem of the first temporal sulcus.

Fissure of Rolando begins in a bifurcation. Neither branch cuts the supra-mesial border. Superior genu is very sharp and sends backwards a short branch.

The External parieto-occipital bifurcates.

Sulcus paramedialis is represented by two short transverse fissures with a long one intervening.

Superior prefrontal sulcus is X shaped. The

anterior limb is continued forwards as the superior frontal sulcus.

Inferior prefrontal sulcus curves back to the Fissure of Rolando.

Between the anterior branches of the Fissure of Sylvius, there is a short stem with a horizontal branch running forwards to the frontal pole, and bifurcating - the inferior frontal sulcus.

The middle frontal sulcus is represented by three short transverse fissures.

Intreparietal sulcus.

Superior and inferior post central sulci are continuous. The inferior has a branch running forwards to the inferior genu of the Fissure of Rolando. The horizontal branch is short.

The Ramus parieto-occipitalis is continued forwards almost to the superior post central and backwards as the transverse occipital sulcus.

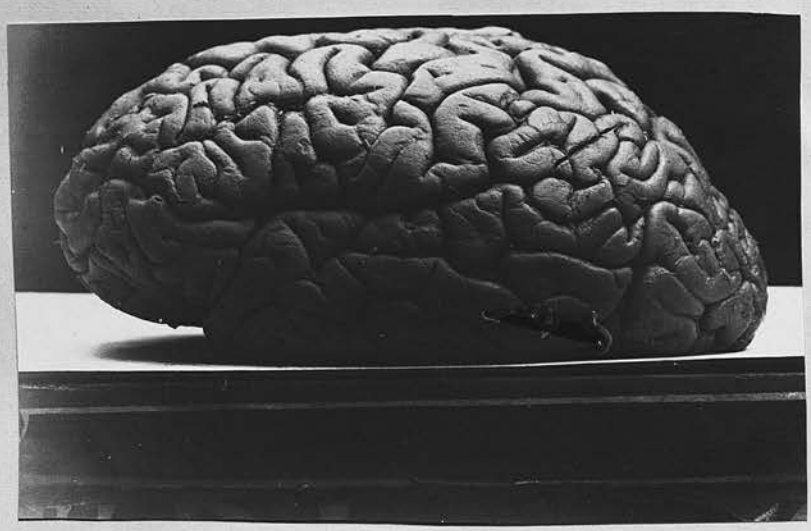
External to the anterior part there is an H shaped sulcus - representing the continuation of the horizontal part of the intraparietal sulcus.

The lateral occipital sulcus does not bifurcate. The transverse occipital sulcus opens into it.

Left Hemisphere.

Fissure of Sylvius. All branches start from a common stem.

Fissure of Rolando bifurcates at upper end. A short branch runs forwards from the superior genu.



External parieto occipital fissure has short anterior branch and a long posterior branch.

Superior and inferior precentral sulci are continuous.

Superior frontal runs forwards from the middle of the superior precentral.

Sulcus paramedialis is 2 inches long.

Middle frontal bifurcates at posterior end and runs forwards to the frontal pole, where it again bifurcates.

Sulcus diagonalis runs down to the Fissure of Sylvius.

Inferior frontal sulcus runs parallel to supra-orbital margin, and fuses with the middle frontal sulcus.

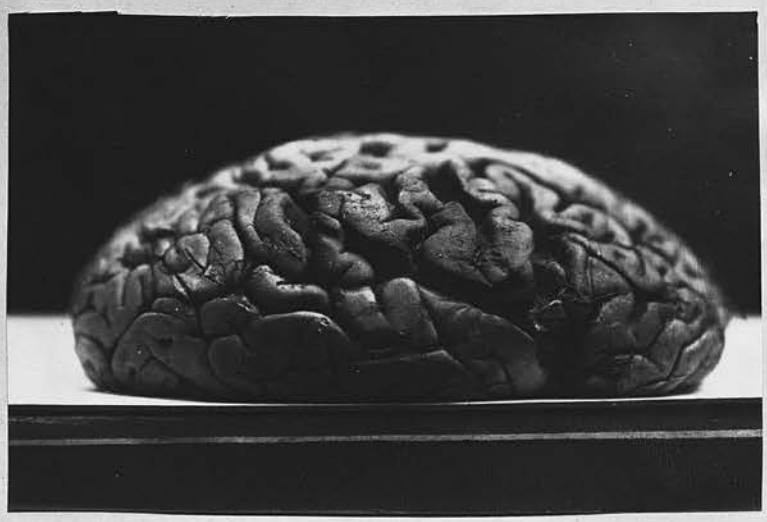
Intraparietal sulcus.

Superior and inferior post central sulci are continuous. Superior has a branch running forwards to the Fissure of Rolando.

The horizontal branch runs back to the Ramus occipitalis.

The ramus occipitalis bifurcates before and behind.

Lateral occipital sulcus runs from second temporal sulcus to occipital pole. It gives off a branch running up towards the sulcus occipitalis transversus.



10. Right Hemisphere.

Fissure of Sylvius. Anterior horizontal branch is short. Anterior ascending ramus rises behind it, and is a little longer.

Posterior horizontal bifurcates. The main stem is short.

Fissure of Rolando cuts the supra-mesial border. Superior genu is well marked. There is a deep annectant gyrus. It doss not open into the Fissure of Sylvius.

External parieto-occipital fissure bifurcates at the supra-mesial border into two diverging branches each 1 inch long.

Superior precentral sulcus is simple with a short branch running back to the Fissure of Rolando.

Superior frontal sulcus opens out of it and runs right forwards to the frontal pole where it bifurcates.

It has one transverse branch two inches from the end.

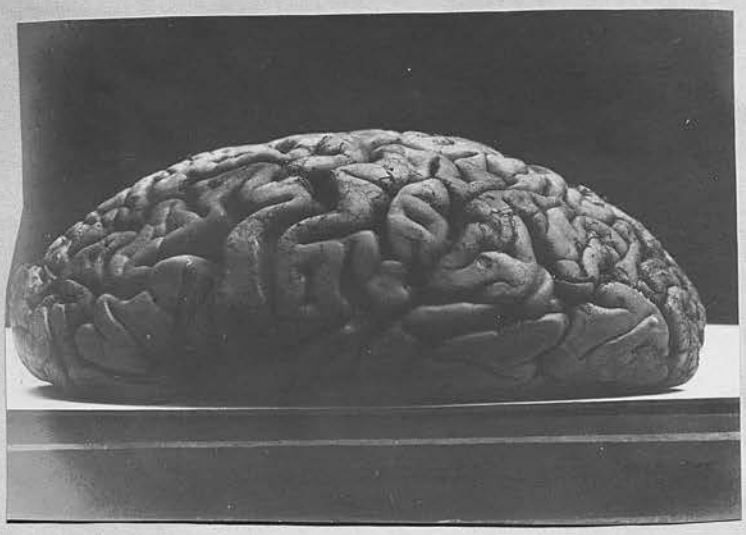
Inferior precentral sulcus is T shaped. The branches are short.

Inferior frontal sulcus is separated from it by a small superficial gyrus. It bifurcates 2 inches from frontal margin.

Middle frontal is not represented unless by anterior portion of superior frontal.

Intraparietal sulcus.

Superior post central sulcus is very near to the Fissure of Rolando in its upper part.



It is separated from the inferior post central by a superficial gyrus.

Inferior post central sulcus is continuous with the horizontal branch which opens into the Ramus occipitalis. It has a branch running downwards and opening into the first temporal sulcus.

The ramus occipitalis is very irregular in outline. It bifurcates at the posterior end and forms the transverse occipital sulcus, which opens into the lateral occipital sulcus.

The first and second temporal sulci ascend high in the parietal lobe.

Left Hemisphere.

Fissure of Sylvius. Both anterior branches are well marked, and arise from a common stem.

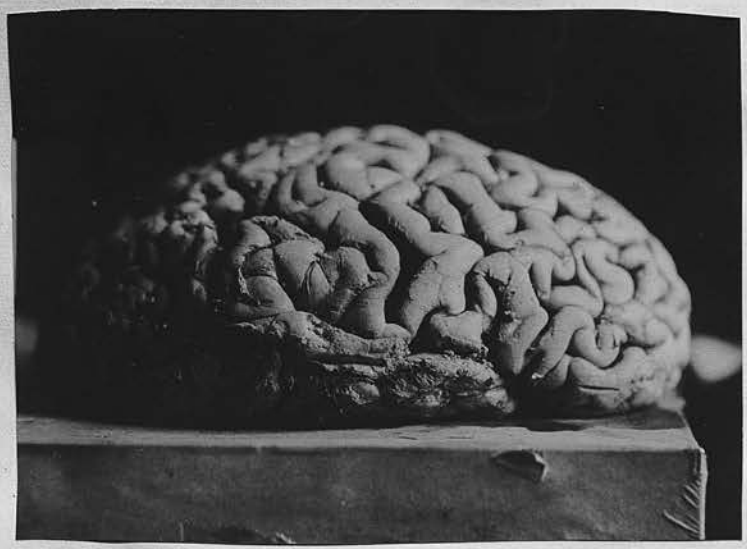
Posterior horizontal is short and divides into two short branches.

Fissure of Rolando cuts supra-mesial border. Both genu are well marked. At the upper there is a deep annectant gyrus.

External parieto occipital fissure has a short stem which bifurcates. Anterior branch runs forwards, posterior transversely for $\frac{3}{4}$ inch.

Inferior precentral has concave curve upwards. The inferior frontal runs forwards out of it.

Superior precentral has a branch running back to the Fissure of Rolando and the superior frontal opens out of it, and runs forwards to the frontal pole. It has a branch running down, and opening into the inferior



precentral.

Superior post central sulcus runs back and down. It is separated by a superficial gyrus from the inferior post central sulcus. The horizontal branch is continuous with the latter. It runs downwards then upwards and backwards to open into the ramus occipitalis.

The first and second temporal sulci are both short and simple.

The transverse occipital bifurcates and sends one branch back to the occipital pole.

The lateral occipital sulcus lies below and parallel to this branch.

11. Right Hemisphere.

Fissure of Sylvius. Anterior branches are separate. Anterior horizontal is very short. The posterior limb bifurcates, and one branch runs backwards and then ascends behind the Fissure of Rolando for a short distance.

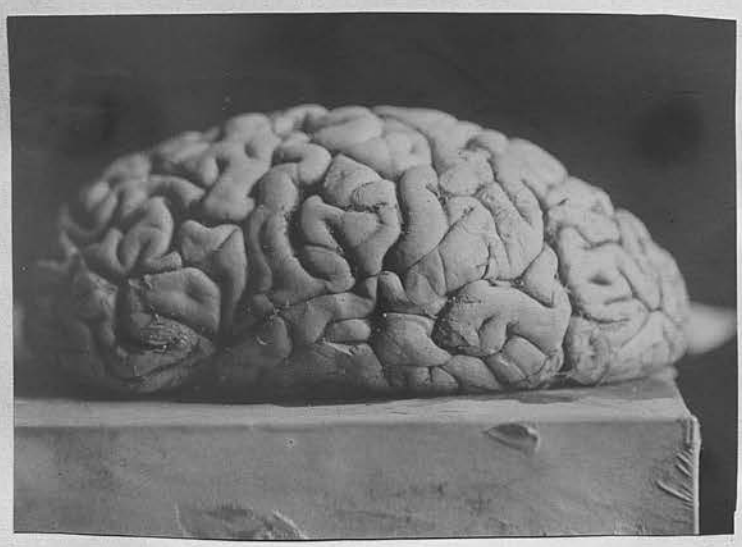
Fissure of Rolando. Superior genu is best marked, and there is a double deep annectant gyrus at this situation. It cuts supra-mesial border.

External parieto occipital fissure is 1 inch long and runs outwards.

Inferior precentral sulcus is T shaped.

Superior precentral sulcus runs down behind this and from it the superior frontal runs forwards.

It is interrupted by a superficial gyrus 2 inches from frontal pole.



Middle frontal gyrus is very sinuous, and is connected by a transverse branch with the inferior frontal. It bifurcates at the supra-orbital margin.

Inferior frontal sulcus runs forwards and downwards.

Superior post central sulcus is continuous with the inferior. At the junction there is a deep annectant gyrus.

Horizontal branch runs backwards and upwards towards the ramus occipitalis, but is separated by a superficial gyrus.

Ramus occipitalis bifurcates at the posterior end forming the ramus occipitalis transversus, which runs down into the lateral occipital sulcus. This bifurcates at the occipital pole.

The first temporal sulcus ascends high in the parietal lobe, and cuts into the Ramus horizontalis.

Second temporal fissure is short.

Left Hemisphere.

Fissure of Sylvius. Anterior branches both well marked - arising from a common stem.

The posterior horizontal limb runs upwards and backwards into the parietal lobe for 1½ inches.

Fissure of Rolando cuts the supra-mesial border but not Fissure of Sylvius. The superior genu is best marked.

There are deep annectant gyri at both genu.

External precentral sulcus runs into Fissure of

Rolando. Inferior precentral is below and in front of it. It has a short branch running backwards.

Superior frontal sulcus runs forwards from superior precentral and bifurcates 2 inches from frontal pole.

Middle frontal lies outside and in front of this. It is triradiate at the beginning and bifurcates on the supra-orbital margin.

Inferior frontal is curved with concavity downwards.

The sulcus diagonalis opens into it.

Intraparietal sulcus.

Superior and inferior post central sulci are continuous. Horizontal branch runs upwards and backwards, but is separated from the ramus occipitalis by a superficial gyrus.

A deep T shaped sulcus runs outwards between the superior postcentral and the ramus occipitalis.

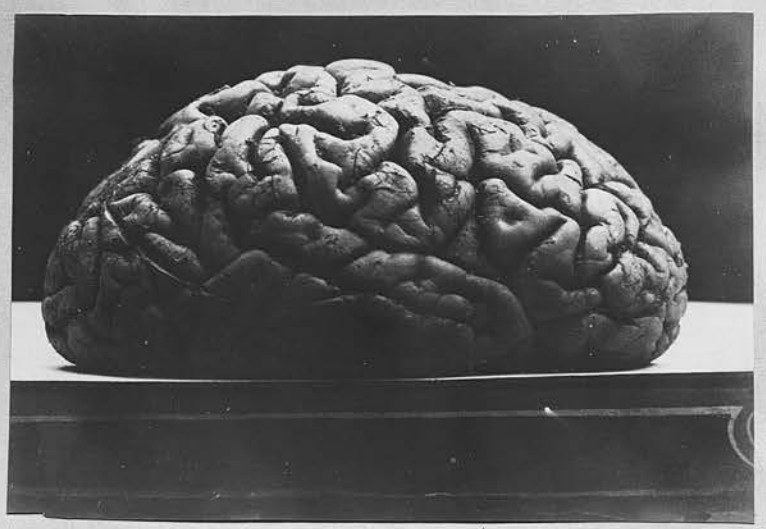
Ramus occipitalis transversus has a branch running back to the second temporal sulcus.

Sulcus occipitalis laterlis has a branch running up behind the ramus occipitalis transversus. Both temporal sulci are short.

12. Right Hemisphere.

Fissure of Sylvius.

Anterior branches arise separately - both are short. Posterior gives off a short branch just behind the Fissure of Rolando.



Fissure of Rolando cuts the supra-mesial border. It gives off short branches - the upper backwards, and the lower forwards on either side of the superior genu.

External parieto-occipital fissure is very short, and bifurcates into two still shorter branches.

Superior precentral sulcus. Near the upper end, it gives off two branches, one running back and the other forwards. Below it gives off the superior frontal sulcus which has an unbroken course forwards.

Inferior precentral sulcus lies in advance of the superior, and gives off a branch running back to the Fissure of Rolando.

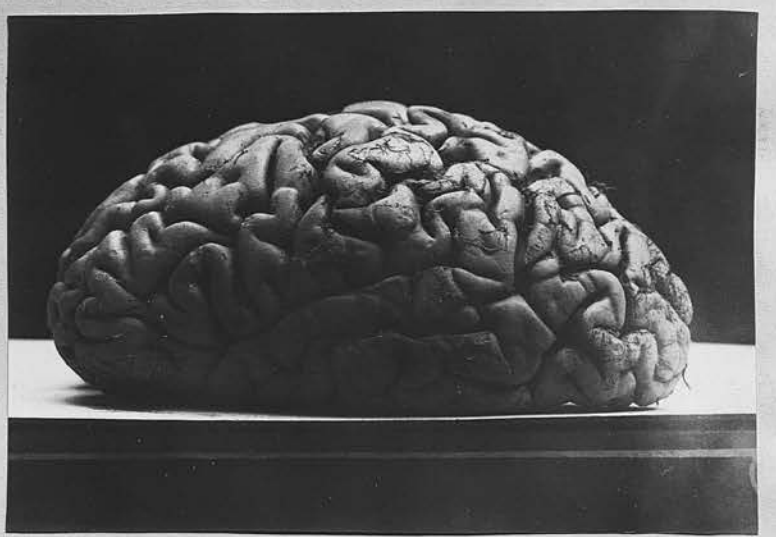
Middle frontal sulcus is only represented at the anterior pole. It is replaced by three vertical fissures.

Inferior frontal sulcus curves forwards and downwards. From it the diagonal sulcus runs into the Fissure of Sylvius.

Superior and inferior postcentral sulci are continuous. The superior is interrupted by two annectant gyri.

The horizontal branch gives off at its commencement a branch running down behind the upturned end of the Fissure of Sylvius, and two with a common origin cutting into the superior parietal lobule.

Ramus occipitalis bifurcates in front and behind. The anterior branch runs into the second temporal



sulcus.

The lateral occipital sulcus runs from the end of the transverse occipital to the occipital pole.

The first temporal sulcus is short.

Left Hemisphere.

Fissure of Sylvius. Anterior branches are separated by ½ inch. Ascending branch runs up into the lower frontal sulcus. The terminal piece of the posterior horizontal is interrupted by a superficial gyrus.

Fissure of Rolando does not cut the supra-mesial border. Genu are poorly marked.

Superior precentral runs back into Fissure of Rolando at the inferior genu.

Inferior precentral lies in front and below it.

Superior frontal sulcus opens from superior precentral and is unbroken in its course.

Inferior frontal is curved downwards and forwards.

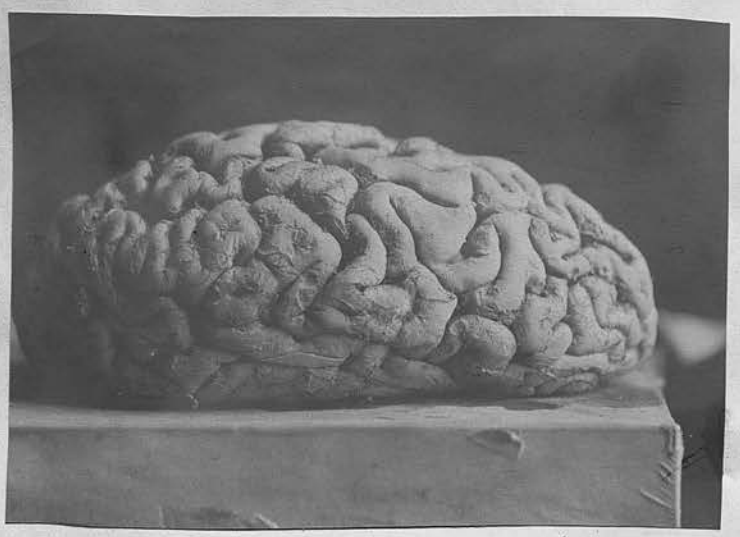
Middle frontal sulcus only seen in anterior third. Two vertical sulci represent posterior half.

Sulcus diagonalis lies in front of inferior precentral.

Superior and inferior post central sulci are continuous.

Horizontal branch opens into ramus occipitalis, which bifurcates at either end.

Sulcus occipitalis transversus is separate and sends a short branch forwards in front of the second temporal sulcus.



Lateral occipital sulcus is short, and lies near the occipital pole.

13. Right Hemisphere.

Fissure of Sylvius. Anterior horizontal branch is short. Anterior ascending runs up into the inferior frontal.

Posterior horizontal bifurcates early into two short branches. The anterior runs up behind the Fissure of Rolando - the posterior is straight.

Fissure of Rolando does not cut the supra-mesial border. Both genu are almost rectangular.

External parieto-occipital fissure bifurcates at the supra-mesial border. Both branches are short.

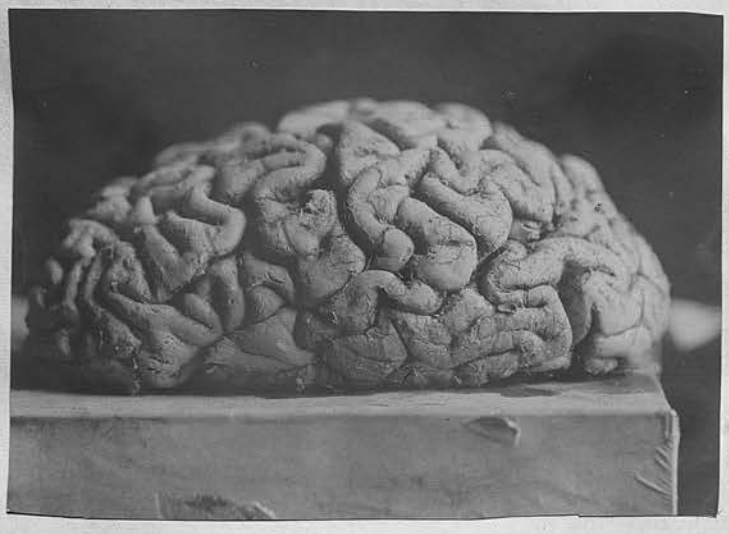
Superior and inferior precentral sulci are continuous. From superior a branch runs backwards to the Fissure of Rolando - only separated by a small superficial gyrus.

From the superior precentral, the superior frontal runs forwards. Its course is interrupted by three superficial gyri.

A broad gyrus interrupts the course of the middle frontal sulcus. A vertical sulcus divides this gyri into two.

The posterior boundary of this gyrus is a vertical sulcus with a branch running up to the superior frontal sulcus.

The inferior frontal sulcus takes a downward and forward course - bifurcating on the supra-orbital margin.



Superior postcentral sulcus is short.

Inferior post-central sulcus runs downwards from the superior genu of the Fissure of Rolando. The horizontal branch runs back to the ramus occipitalis, which bifurcates at either end.

Behind the transverse occipital sulcus, there is a deep sulcus cutting the supra-mesial border 1 inch from the occipital pole.

The first and second temporal sulci ascend high up in the parieto-occipital lobe, parallel to each other.

The lateral occipital sulcus has a short stem with two long branches.

Left Hemisphere.

Fissure of Sylvius. All three branches are short. Posterior limb bifurcates.

Fissure of Rolando does not cut the supra-mesial border, and ends 1 inch above the Fissure of Sylvius.

External parieto-occipital fissure has a forward and outward course.

Superior precentral sulcus cuts the supra-mesial border. It runs forwards, then backwards and downwards to the Fissure of Rolando.

Inferior precentral is horizontal then vertical.

It cuts into the Fissure of Sylvius behind the ramus anterior ascendens.

Superior frontal sulcus is represented by three transverse sulci - the posterior opening into the

Middle frontal sulcus. This runs from the superior precentral - separated from it by a superficial gyrus - downwards and forwards to the supra-orbital margin, where it bifurcates. There are three parallel vertical sulci opening into it from below.

Inferior frontal runs forwards with a convex curve downwards to the frontal pole, where it is limited by a vertical sulcus.

Superior post central sulcus is continuous with the inferior. It bifurcates at the upper end. The inferior and horizontal branches have a convex curve forwards with a branch opening into the Fissure of Rolando. It runs into the ramus occipitalis, which bifurcates at either end, but the transverse occipital sulcus is formed separately behind the bifurcation.

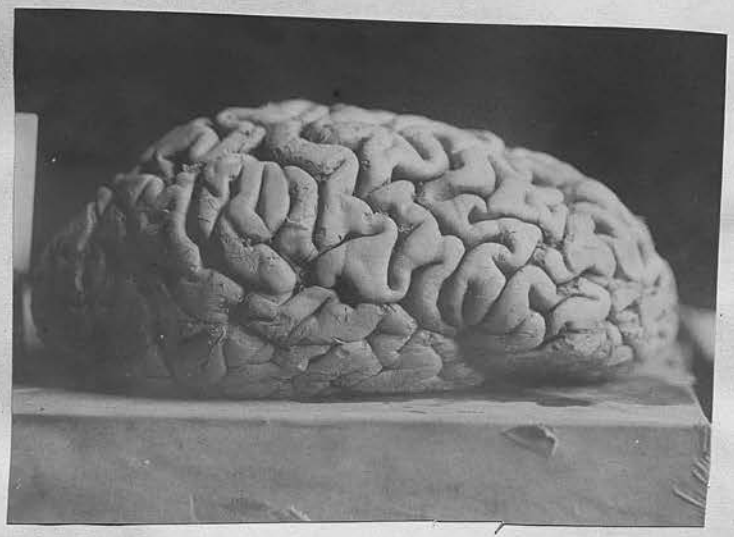
First temporal sulcus almost divides the occipital lobe in two. It divides and the posterior branch runs into the transverse occipital sulcus.

The second temporal sulcus cuts the occipito-temporal border 1½ inches in front of the occipital pole - bifurcating into a horizontal sulcus.

The lateral occipital sulcus is short and bifurcates at the occipital pole.

14. Right Hemisphere.

Anterior ascending and horizontal branches arise from a common stem. The ascending runs into the lower frontal sulcus. The posterior horizontal branch runs backwards and bifurcates. The inferior



branch continues backwards and is interrupted by a deep annectant gyrus, then ascends high in the parietal lobe.

Fissure of Rolando cuts the supra-mesial border. The upper genu is rounded - the lower is sharp. It is separated from the Fissure of Sylvius by a small gyrus.

External parieto-occipital fissure bifurcates at the supra-mesial border. One branch runs along the border for 1 inch - the other is transverse - ½ inch long.

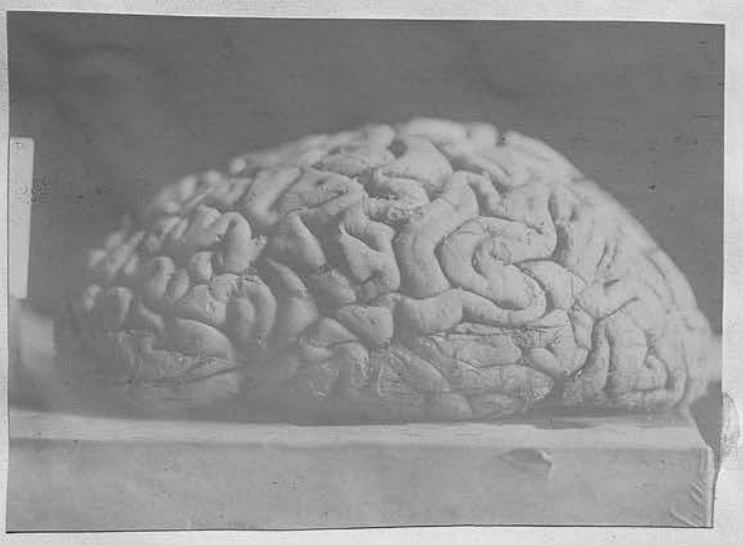
Superior precentral sulcus bifurcates above and below. From the middle part, the superior frontal sulcus branches off. This is interrupted by a superficial annectant gyrus, which runs vertically across the frontal lobe about the middle.

The inferior precentral lies in front of the superior and below it. From it, the inferior frontal sulcus runs forwards and downwards, bifurcating behind the ascending branch of the Fissure of Sylvius.

Middle frontal sulcus runs forwards across the middle of the lobe to the supra-orbital margin, where it bifurcates.

From the middle of the inferior precentral, a sulcus runs forwards and upwards to the supra-mesial border.

The superior and inferior post central sulci are continuous. The superior bifurcates at its upper end. The horizontal branch runs into the



ramus occipitalis, which bifurcates behind to form the transverse occipital sulcus, and in front.

Between this and the superior post central, a deep fissure 1 inch long runs transversely across the parietal lobe.

The upturned end of the Fissure of Sylvius - the first and second temporal sulci lie behind one another in parallel lines.

The lateral occipital sulcus bifurcates.

Left Hemisphere.

Fissure of Sylvius.

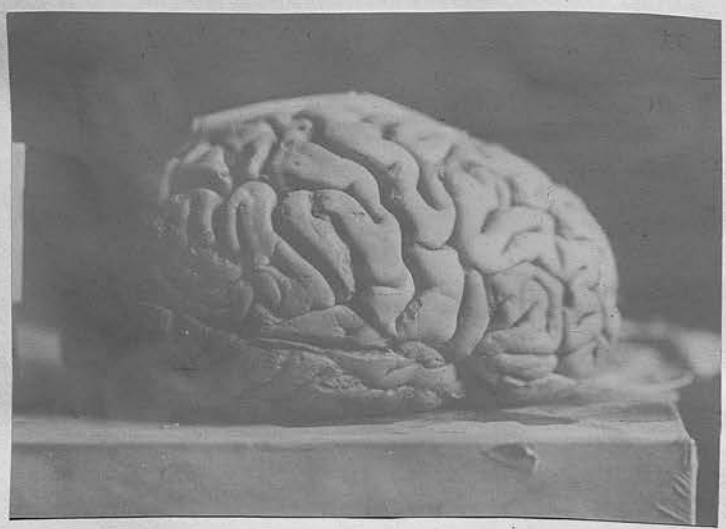
Anterior branches arise from a common stem - both short. Posterior horizontal limb is interrupted by a superficial gyrus 2½ inches behind the Fissure of Rolando. It ascends high in the parietal lobe.

Fissure of Rolando does not cut either the supra-mesial border or the Fissure of Sylvius. There are three branches - one at superior genu - one at the inferior and one below this.

External parieto-occipital fissure bifurcates into two short branches.

Superior precentral sulcus runs downwards and forwards. From the middle part the superior frontal runs forwards and backwards. Inferior frontal has a curve - convex forwards. Middle frontal is interrupted by two superficial gyri. It bifurcates near the super-ciliary margin.

The inferior frontal sulcus is short and curved with its convexity upwards - running from inferior precentral sulcus.



Superior and inferior post central are continuous. They give off three short branches running towards the Fissure of Rolando.

The horizontal branch runs back and upwards to the ramus occipitalis, which bifurcates in front and behind. There is a deep double sulcus between the anterior branch and the Fissure of Rolando.

First temporal sulcus ascends high in the hemisphere, the second is shorter.

15. Right Hemisphere.

Fissure of Sylvius. The two anterior branches arise from a common stem, which is ¼ inch long. The anterior horizontal runs forwards and upwards, and the ascending branch runs into the inferior frontal. Posterior limb bifurcates, and the anterior branch runs up into the horizontal branch of the intraparietal sulcus.

Fissure of Rolando does not cut the supra-mesial border or the Fissure of Sylvius. It is nearly vertical in direction, and the angles of the genu are obtuse.

External parieto-occipital fissure is short.

Superior precentral sulcus lies in front of the upper part of the Fissure of Rolando. Two short branches run back to the Fissure of Rolando, and a short one forwards. From the middle, the superior frontal comes off. This is interrupted at the beginning by a vertical deep annectant gyrus. It is

sinuous and runs forwards to the frontal pole.

Inferior precentral sulcus lies below and in front of the superior, and runs into the Fissure of Sylvius. The inferior frontal cuts it into two, and describes a curve with its concavity backwards, bifurcating at its termination.

The middle frontal: behind it is represented by two short vertical sulci - but it is complete in front, where it bifurcates as usual.

Superior post central sulcus lies behind the upper part of the Fissure of Rolando, with a short branch running forward to the Fissure of Rolando. A superficial annectant gyrus separates it from the inferior post central. The horizontal branch runs from the middle of the gyrus, intervening between the inferior postcentral and the Fissure of Rolando forwards to the Ramus occipitalis.

In front of the ramus occipitalis there is the end of the calloso-marginal fissure, which bifurcates.

The sulcus transversus occipitalis is curved - with the concavity backwards.

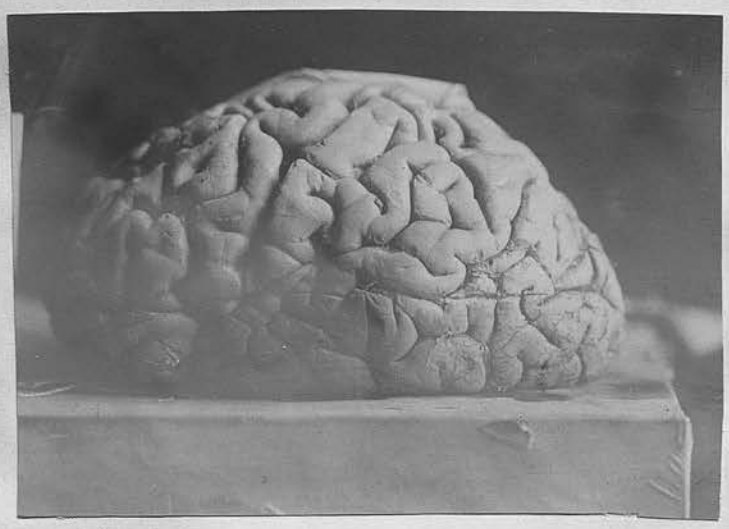
The first temporal sulcus runs up to the horizontal branch of the intraparietal.

The second temporal is short.

The lateral occipital sulcus is curved with the concavity downwards, and it ends in a bifurcation.

Left Hemisphere.

Fissure of Sylvius. The anterior horizontal is



separated from the ascending branch at its commencement by a superficial gyrus.

The ascending branch runs into the inferior frontal. The posterior limb runs back and up to the ramus occipitalis.

Fissure of Rolando is nearly vertical.

The inferior genu is sharp, and the horizontal branch of the intraparietal sulcus cuts into it.

External parieto-occipital fissure is double - due to bifurcation on the internal surface.

Superior precentral is continuous with the inferior.

Superior frontal arises opposite the superior genu of the fissure of Rolando, and runs forwards to the frontal pole.

Middle frontal sulcus runs from the inferior precentral forwards and downwards to the supra-orbital margin where it bifurcates.

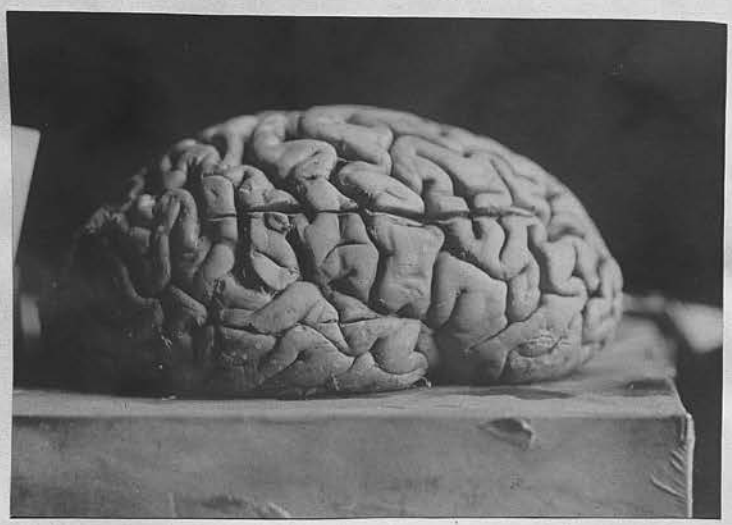
The inferior frontal sulcus is curved with the concavity forwards and upwards.

Superior and inferior postcentral sulci are only separated by a deep annectant gyrus.

The horizontal branch runs back from the point of union to the ramus occipitalis.

The upturned end of the calloso-marginal fissure bifurcates behind the superior postcentral.

A vertical branch runs down between the upturned end of the Fissure of Sylvius and the first temporal, and cuts across the horizontal branch of the intra-



parietal.

The transverse occipital cuts into the lateral occipital sulcus, which runs transversely across the occipital lobe, with a slight downward concavity. It runs forwards from the occipital pole.

16. Right Hemisphere.

Fissure of Sylvius.

Horizontal branch runs backwards for 2⅛ inches, then turns upwards vertically for 1½".

Fissure of Rolando does not cut the supra-mesial border. Both genu are rectangular and marked by deep annectant gyri.

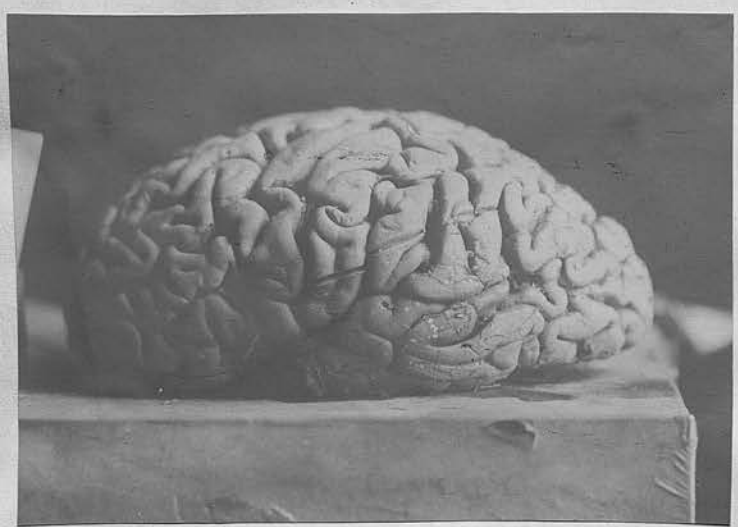
External parieto-occipital fissure is short and bifurcates at its extremity.

Superior precentral sulcus lies in front of the upper part of the Fissure of Rolando. A short horizontal branch comes off from the upper end.

Inferior precentral lies in front and below it. From the upper part of the inferior precentral, the superior frontal arises. Its course is interrupted by two superficial gyri.

The middle frontal sulcus is irregular. It runs below and parallel to the superior frontal for 1½ inches, then bifurcates. The posterior part is separated by a superficial gyrus from the anterior. A second superficial gyrus interrupts its course before it bifurcates on the supra-orbital margin.

The sulcus diagonalis runs down behind the



ascending branch of the Fissure of Sylvius.

The superior and inferior postcentral sulci are continuous. From the junction, the horizontal branch runs forwards to the ramus occipitalis.

The ramus occipitalis bifurcates at either end. The anterior branch runs down in front of the upturned end of the Fissure of Sylvius, and the posterior branch forms the transverse occipital sulcus. The first and second temporal sulci lie parallel to the Fissure of Sylvius.

The lateral occipital sulcus is straight, and bifurcates at the posterior end.

Left Hemisphere.

The anterior branches arise from a common stem. The horizontal branch is a mere notch.

The posterior limb turns up at right angles into the parietal lobe.

Fissure of Rolando is nearly vertical in direction, and the genu are very obtuse.

The external parieto-occipital fissure is straight.

Superior precentral sulcus lies parallel to the upper two thirds of the Fissure of Rolando.

The inferior precentral lies in front of and below the lower part, and runs down to the Fissure of Sylvius.

The superior frontal cuts across the upper part of the superior precentral. It bifurcates at its extremity.

The middle frontal runs forwards from the upper part of the inferior precentral. A small superficial gyrus breaks its continuity near the commencement. It gives off three short branches - one above and two below, and bifurcates at the end.

The inferior frontal sulcus runs from the lower part of the inferior precentral. It bifurcates 1½ inches from the frontal pole.

Superior postcentral sulcus is irregular. It bifurcates at either end. The upper posterior branch runs back parallel to the supra-mesial border, then cuts it in front of the external parieto-occipital fissure.

Inferior postcentral runs down to the Fissure of Sylvius. The horizontal branch runs back from the Fissure of Rolando to the ramus occipitalis. A vertical branch cuts it behind the upturned end of the Fissure of Sylvius.

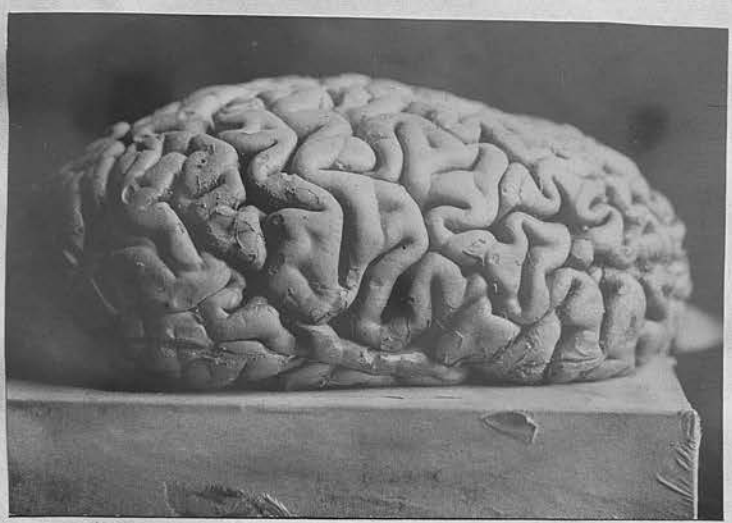
The ramus occipitalis bifurcates in front and behind. Behind the anterior branch, there is a short sulcus separated from the ramus occipitalis by a superficial gyrus.

The second temporal sulcus lies behind the transverse occipital and is nearly horizontal.

17. Right Hemisphere.

Fissure of Sylvius.

Both anterior branches are short and arise from a common stem. Posterior limb runs up behind the



inferior postcentral, and gives off a short branch running downwards.

Fissure of Rolando. The upper end cuts the supra-mesial border. Inferior genu is better marked. There is a deep annectant gyrus at the superior genu and another 1 inch above the lower end.

External parieto-occipital fissure bifurcates just at the supra-mesial border. Both branches are short and run outwards.

Inferior precentral is T shaped. It also gives off a short branch running forwards.

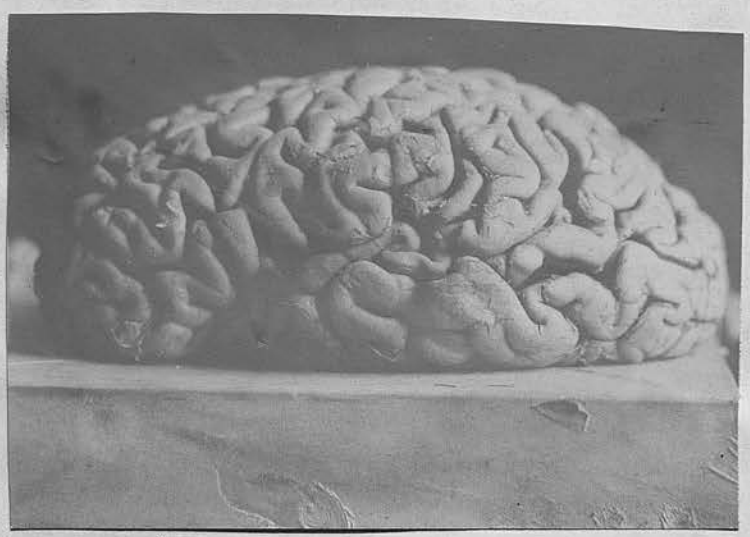
Superior precentral bifurcates at the upper end. It opens into the inferior precentral. It has a short branch running back to the superior genu of the Fissure of Rolando.

Superior frontal sulcus opens from superior precentral, and runs forwards bifurcating 2 inches from frontal pole. It has one branch running up to the supra-mesial border, and one down into the middle frontal. This latter is very sinuous. It gives off two branches from each side, and bifurcates higher up than usual.

Inferior frontal sulcus opens from the inferior precentral, and runs downwards and forwards bifurcating 1 inch above the orbital margin.

Superior and inferior post central sulci are separated by a deep annectant gyrus.

Horizontal ramus runs upwards and backwards separated from the ramus occipitalis by a superficial



gyrus. It runs nearly up to the supra-mesial border, and there is also a long branch running downwards. Between this and the superior postcentral sulcus, there is a transverse isolated sulcus.

Ramus occipitalis bifurcates at the posterior end forming the sulcus occipitalis transversus, which opens into the lateral occipital sulcus. This again bifurcates - one branch running up behind and parallel to the transverse occipital sulcus.

First temporal sulcus runs up behind the descending branch of the ramus horizontalis.

Second temporal is short and bifurcates.

Left Hemisphere.

Fissure of Sylvius. Anterior branches arise separately. The anterior horizontal is short. Posterior limb bifurcates behind the Fissure of Rolando. Each branch again bifurcates at its termination.

Fissure of Rolando does not cut the supra-mesial border - but runs backwards parallel to it for a short distance. The genu are not well marked.

External parieto-occipital fissure is short.

Inferior precentral is T shaped. Each branch bifurcates at its termination.

Superior precentral runs back to the Fissure of Rolando.

Superior frontal sulcus runs forwards. It gives off a long branch running transversely downwards

nearly to the inferior frontal.

Middle frontal starts in front of this and also gives off a long branch running downwards. It bifurcates on the supra-orbital margin.

Inferior frontal runs from the inferior precentral. It gives off one branch from each side, and ends in a wide bifurcation.

Superior and inferior post central sulci are continuous. The horizontal branch is separated from the ramus occipitalis by a deep annectant gyrus. It gives off a branch running up to the supra-mesial border, and down in front of the first temporal sulcus.

First temporal sulcus ascends high in the parietal lobe. Between it and the Fissure of Sylvius there is a deep well-marked sulcus.

Second temporal sulcus runs nearly up to the ramus occipitalis.

Ramus occipitalis transversus opens nearly into the lateral occipital sulcus, which opens out of the second temporal. It bifurcates at the occipital pole.

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